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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 14 AUG 2003

WISS PCT

Applicant's or agent's file reference A3-0224 PYK/rsa	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).	
International Application No.  <b>PCT/SG03/00074</b>	International Filing Date (day/month/year) 4 April 2003	Priority Date (day/month/year) 5 April 2002
International Patent Classification (IPC) or national classification and IPC  Int. Cl. <sup>7</sup> H01L 29/15, 33/00, H01S 5/34		
Applicant NATIONAL UNIVERSITY OF SINGAPORE et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheet(s).

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 17 July 2003	Date of completion of the report 28 July 2003
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer  <b>RAJEEV DESHMUKH</b> Telephone No. (02) 6283 2145

**I. Basis of the report****1. With regard to the elements of the international application:\***

- ☒ the international application as originally filed.
- ☐ the description, pages , as originally filed,  
pages , filed with the demand,  
pages , received on with the letter of
- ☐ the claims, pages , as originally filed,  
pages , as amended (together with any statement) under Article 19,  
pages , filed with the demand,  
pages , received on with the letter of
- ☐ the drawings, pages , as originally filed,  
pages , filed with the demand,  
pages , received on with the letter of
- ☐ the sequence listing part of the description:  
pages , as originally filed  
pages , filed with the demand  
pages , received on with the letter of

**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:**

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

**4. ☐ The amendments have resulted in the cancellation of:**

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.

**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims 1-22	YES
	Claims	NO
Inventive step (IS)	Claims 1-22	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-22	YES
	Claims	NO

**2. Citations and explanations (Rule 70.7)**

GB 2358281 A (SHARP KABUSHIKI KAISHA) 18 July 2001  
US 2002/0003918 A1 (OOI et al.) 10 January 2002  
US 2002/0004253 A1 (OOI et al.) 10 January 2002  
US 2001/0041379 A1 (SAKATA) 15 November 2001  
GB 2369492 A (KAMELIAN LIMITED) 29 May 2002  
US 4751194 A (CIBERT et al.) 14 June 1988  
CA 2331567 A1 (NATIONAL RESEARCH COUNCIL OF CANADA) 1 March 2002  
US 6238944 B1 (FLOYD) 29 May 2001  
US 6027989 A (POOLE et al.) 22 February 2000  
US 5238868 A (ELMAN et al.) 24 August 1993  
US 5395793 A (CHARBONNEAU et al.) 7 March 1995

**NOVELTY (N), INVENTIVE STEP (IS) Claims 1-22**

None of the cited documents discloses or (individually or in an obvious combination) suggests the invention as claimed wherein (A) a plurality of layers of a plurality of materials are applied to a plurality of selected regions, (B) a plurality of degrees of intermixing is caused upon thermal annealing in a plurality of portions of the quantum regions disposed immediately below each of the selected regions of the surface, (C) the original band gaps of the portions of the quantum region are shifted upon further thermal annealing, and, (D) a modified semiconductor is formed that exhibits a plurality of different band gaps in the plurality of portions or the quantum region depending upon the positioning of the plurality of layers of the plurality of materials on the surface immediately above the respective portions of the quantum region. Therefore the claimed invention is novel, involves an inventive step, and is industrially applicable.